

TEACHER GUIDE

9th–12th Grade

Includes Student
Worksheets

Science



Weekly Lesson Schedule



Labs



Supply List



Answer Key

BIOLOGY



THE STUDY OF LIFE FROM
A CHRISTIAN WORLDVIEW

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9th–12th Grade

Includes Student
Worksheets

Science



Weekly Lesson Schedule



Labs



Supply List



Answer Key

Master's Class Biology



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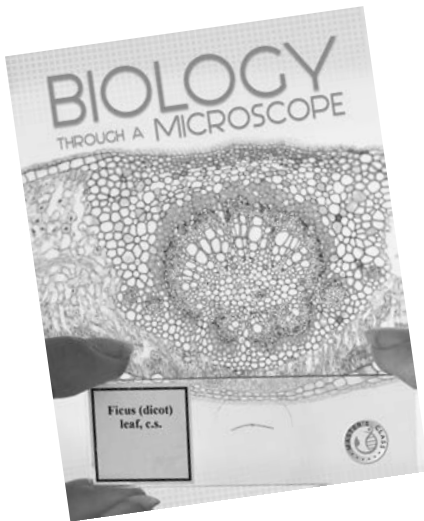
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Table of Contents

Using This Teacher Guide	4
Course Objectives	4
Course Description	5
Teacher Instructions for the Laboratory.....	7
Teacher Instructions for Quizzes and Examinations.....	11
Grading Sheet	13
Suggested Daily Schedule	15
Worksheets and Laboratory Reports	23
Quizzes	237
Exams	295
Answers to Worksheets, Laboratory Reports, Quizzes and Exams.....	313



**Optional
lab book
available.**



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Using This Teacher Guide

Features: The suggested weekly schedule enclosed has easy-to-manage lessons that guide the reading, worksheets, and all assessments. The pages of this guide are perforated and three-hole punched so materials are easy to tear out, hand out, grade, and store. Teachers are encouraged to adjust the schedule and materials needed in order to best work within their unique educational program.

Lesson Scheduling: Students are instructed to read the pages in their book and then complete the corresponding section provided by the teacher. Assessments that may include worksheets, activities, quizzes, and tests are given at regular intervals with space to record each grade. Space is provided on the weekly schedule for assignment dates, and flexibility in scheduling is encouraged. Teachers may adapt the scheduled days per each unique student situation. As the student completes each assignment, this can be marked with an “X” in the box.



Approximately five hours of course work a week



Includes answer keys for worksheets, quizzes, lab reports, and exams



Worksheets to help assess student learning



Quizzes and exams are included to help reinforce learning and provide assessment opportunities



Designed for grades 9 to 12 in a one-year course

Course Objectives: Students completing this course will

- ✓ Investigate the core concepts of classical and modern biology
- ✓ Become familiar with the meaning of key terms in biology
- ✓ Explore the fundamental concepts of cell biology and important recent developments
- ✓ Study the development of classical genetics and modern concepts in the expression of DNA and how it varies with age and changing environmental conditions
- ✓ Learn the coordination and maintenance of the parts of an organism
- ✓ Study the variety of life forms and how their roles are integrated in an ecosystem
- ✓ Explore varied views of the origin of life and how the biblical narrative is consistent with what is observed in the study of biology
- ✓ Conduct laboratory procedures that develop important skills and illustrate important concepts
- ✓ Write lab reports each week to further develop writing skills in a scientific context

Course Description

This course provides important training and practice in developing skills involved in the study of biology, including observing and recognizing interactions and interdependencies of organisms in their natural environment, the use of a light microscope, dissection skills, and insights and recent advances in modern biology.

Life is from God. When God removes life, an organism dies. In Darwin's day, some organisms appeared to be very simple when contrasted to larger more complex organisms. Along with the blessings of modern tools to study life, it has become obvious that no life is simple. This makes sense because nothing that God creates is simple. An example is that the enzymes that control the functions of DNA are formed by the very DNA that they control. That would be like saying that a tool that you made helped you make the tool. How could a tool help you make itself if the tool were not there to begin with? Confusing, right? The DNA that controls all life forms was created at the beginning by the God that spoke life into being. The level of DNA necessary for life is called irreducible complexity.

The course begins with a review of chemical principles needed for biology, including the Biology of water, carbohydrates, proteins, and nucleic acids. The function of life is controlled by proteins called enzymes that are formed from the blueprint of DNA. Patterns of inheritance and modern genetics are introduced to help explain why we differ in so many ways. Patterns of variation in DNA and its expression are introduced. Consider that all of the variations in humans today had their roots in the DNA of two humans (Adam and Eve).

The course treats energy release through respiration, food and oxygen production through photosynthesis and chemosynthesis, along with the transfer of energy from producers to consumers to decomposers.

The kingdoms of life and their taxonomies are introduced along with experiences to study and observe various ecosystems and how they vary over time.

The course climaxes with consideration of issues of biological origins and how the approach differs depending upon assumptions of the nature of life and reality. Whether one comes from a theistic or secular point of view makes a huge difference in the interpretation of origins. The course concludes with human origins that have huge implications as to whether or not we were created in God's image with an eternal destiny or the sum product of natural laws acting upon atoms and molecules.

Each chapter in the textbook has accompanying worksheets and quizzes in the teacher's guide. Every 3 or 4 weeks, the student is to take an examination. Each chapter in the text has a laboratory exercise that teaches particular skills, illustrates insights in the concepts studied, and provides experience in preparing laboratory reports.

Teacher Instruction for this Course

This guide provides additional help in guiding students through the text and the laboratory exercises, along with a list of supplies not readily available around the house or in a local store. The labs are designed to be done at home. I have not included anything in the labs that I would not want in my home. The specimens for dissection are not preserved in harmful compounds — even though they should still be kept out of the mouth. Additional guidelines are given for the lab reports, worksheets, quizzes, and exams.

A mature study takes place in stages. Each of the concepts introduced in this study can be built upon and added to in future studies. How far a student should go in a study over a lifetime depends upon life goals. For example, this study may be sufficient for someone going into computer science, but someone going into medicine will take many more advanced courses later in college.

Reading: The required reading in this course is very rigorous and detailed. For students who are having difficulty in reading the chapter or understanding some of the concepts, the second day can be used to either complete the reading and/or worksheet or to focus on specific parts of the chapter that may need review. It is vital that the student understand the reading material to complete the course. The Glossary, which contains the vocabulary words, begins on page 320 in the student book.

Worksheets: The worksheets are important in indicating what the student needs to remember from the chapters and if they are ready for the quiz. The student needs to answer the questions in the worksheet. This is not a quiz, so the student can look at the answers after attempting them. The student needs to go back over the chapter to see why any questions were not answered correctly.

Quizzes: After understanding the correct answers to the questions on the worksheet, the student is to request the quiz. The quiz is to be taken with closed book and without using the worksheet. The teacher (parent) is to grade the quiz and record the grade on the grade sheet in the teacher's guide.

Exams: Every 3 or 4 weeks the student will take an exam. In preparation for the exam, the student is to reread the chapters covered on the exam, and answer the questions again on the worksheets and quizzes. This is why the answers were not written on the worksheets and quizzes. The student is to ask for the exam after studying the chapters, worksheets, and quizzes. The teacher (parent) grades the exam and records the grade.

It is normal to do better in some areas than in others. Learning is more than memorizing. Some of the questions depend upon recall, but some also depend upon reasoning skills. Through practice these skills are developed. If the student gets discouraged, be a source of encouragement. Some areas will be like going through a pleasant grassy valley, but others may be like fording a stream or climbing up a hillside.

The spiritual insights and Scripture references are important and not just a nice tack-on. These references are given in context with the subject matter. To just pop them in randomly would be to tell the student that they have nothing to do with biology — which is certainly not the case.

Vocabulary Words: On the second page of every chapter in the student book, vocabulary words are introduced that are highlighted in that chapter's text and have brief definitions found in the glossary at the back of the book. Students are encouraged to either write these out on 3 x 5 cards or to create another useful means of reviewing these throughout their course of study. Comprehension of sometimes difficult terms and concepts is very important to completing a course in Biology or any other complex science study.

Biology Credits for Transcripts

This is a one-year course with two full semesters, helping the student fulfill one credit per semester of biology, which includes the lab. High school transcripts will list the course as Biology with Labs. If questions arise from state agencies or schools, they can be referred to the course content.

Teacher Instructions for the Laboratory

This information is given so that the teacher (parent) can come alongside the student in helping line up the necessary materials, overseeing the procedures where necessary, and evaluating the lab reports. Be sure that complete sentences are used in the reports except where data are being recorded. This provides added writing experience and is clearer to someone reading the report. Do not hesitate to ask someone with more background in biology to come alongside in areas where you feel less confident.

Students are to use the “Laboratory” pages for taking notes, making general observations, and recording data. The “Laboratory Report” pages (see following examples) are for the student to write out their full observations, data, and conclusions. Any questions asked in the lab instructions are to be answered in the report. It may be helpful to read through the entire lab and the lab report before beginning each lab project.

WARNING: As with any science course that includes laboratory exercises, some things can be potentially hazardous if not handled properly. Make sure to carefully follow all instructions:

- ✓ Wear proper safety equipment when needed, including safety goggles/glasses.
- ✓ Keep small children away from where the labs are being conducted.
- ✓ Wash hands, surfaces, and equipment properly after each experiment.
- ✓ Make sure clothing and other household items and surfaces are protected from staining.
- ✓ Handle the microscope with care — always carry it with two hands.
- ✓ Do not place anything used for labs in your mouth. Some chemicals can be poisonous.

Here is a list of supplies that need to be available for the labs. These are not readily available outside of a science laboratory and can be ordered online or purchased from a science supply retailer. Kits containing these supplies and a microscope can be obtained from Homeschool Science Products online.

Item	Order Info	Product ID	Lab Used
☐ 100 ml Beakers (3)	Supply Kit	CE-BEI0100	10, 26
☐ 1-2 foot square of screen / chicken wire	Hardware Store		10, 26
☐ 2-inch long segments of water plant (5)	Pet Shop / Pond Algae	LD-ELODEA	12
☐ 50 ml graduated cylinder	Supply Kit	CE-CYGL050	2, 4, 7
☐ 95% Ethanol	Supply Kit	UN-ETHYALC	4
☐ Construction Paper Strips	Hobby Store		14
☐ Stopper (4)	Supply Kit	CE-STOP0XC	3
☐ Drinking Straw	Fast Food		12
☐ Earthworm Dissection Guide	Supply Kit	DE-GDWORM	24
☐ Earthworm Specimen	Supply Kit	PM-WORM	24
☐ Wax Pencil	Supply Kit	BE-WAXPENC	3, 7, 12, 13, 17
☐ Filter Funnel	Supply Kit	CE-FUNNEL	4
☐ Filter Paper	Supply Kit	CE-FILTAP	4
☐ Frog Dissection Guide	Supply Kit	DE-GDFROG	25

☐ Frog Specimen	Supply Kit	PM-FROG4S	25
☐ Glucose	Supply Kit	CH-DEXTROS	13
☐ Iodine Solution	Supply Kit	CH-IODINE	3
☐ Methylene Blue stain	Supply Kit	CH-METHBLU	6
☐ Metric Ruler	Supply Kit	DE-SET1	3, 7, 13
☐ Microscope	Supply Kit	MI-1100LED	5, 6, 8, 9, 14, 17, 18, 22, 23, 24, 25
☐ Microscope slide & cover slip	Supply Kit	MS-SLIDSET	5, 6, 23
☐ Nitrile Gloves (5)	Supply Kit	GS-GLOVNIT	4, 24, 25
☐ pH indicator paper	Supply Kit	CH-PHSTRIP	2
☐ Phenol red pH indicator	Supply Kit	CH-PHENRED	12
☐ Eyedropper	Supply Kit	DE-SET1	2, 3, 4, 6
☐ Prepared slides (various)	Supply Kit	MS-SETBIO	6, 8, 9, 14, 17, 18, 22, 23, 24, 25
☐ PTC taste test paper	Supply Kit	CH-PTCTEST	19
☐ Safety Scalpel #11	Supply Kit	DE-SET1	24, 25
☐ Scissors (Sharp tip)	Supply Kit	DE-SET1	24, 25
☐ Stirring Rod	Supply Kit	CE-STIR10	4
☐ T-Pins	Supply Kit	DE-SET1	24, 25
☐ Styrofoam Dissection Tray (3)	Supply Kit	DE-TRAYS	24, 25
☐ Test Tubes (Large - 22ml)	Supply Kit	CE-TTUBEKT	3, 4, 12, 13
☐ Test Tubes (Small)	Supply Kit	CE-TTUBESM	13
☐ Tweezers	Supply Kit	DE-SET1	2, 18
Optional Enrichment Exercise Supplies			
☐ Antibiotic Discs	Supply Kit	LM-ANTIKIT	17, 18
☐ E. Coli Live Cultures*	Supply Kit	LD-ESCHCOL	17, 18
☐ Grasshopper Dissection Guide	Supply Kit	DE-GDGRASS	24
☐ Grasshopper Specimen	Supply Kit	PM-GRASHOP	24
☐ Sterile Swab (2)	Supply Kit	PT-SWABS	17
☐ Prepared Tryptic Soy Agar Plates*	Supply Kit	BE-PPLATES	17, 18

Note: *Order these items 7–10 days before you need them as they are perishable.

**Laboratory Report** (20 points possible)*Living Things Observed in the Area*

At the Bozeman ponds (Bozeman, Montana) I see a body of water surrounded by tall willow trees and an occasional path leading down to the water. There are grasses farther on shore from the trees. The water is rippling with mallard ducks swimming across the water and on the shore. There is a lot of leaf litter on the shore and in the water from the trees.

A Keystone Species

The willow trees appear to be a keystone species. They stabilize the shoreline and provide shelter for the ducks. The leaves appear to be discolored perhaps with fungus and bacteria growing on them.

I cannot see any water insects or algae in the water, but the ducks are feeding on something in the water and these are typically fed upon by ducks. The ducks will deposit their waste in the water and on the shore which will provide nutrients for the algae, water insects, and shore plants. The ducks also appear to be a keystone species.

Life Forms That Feed Upon Other Life Forms

The ducks appear to feed on water insects and algae in the water.

Life Forms That Are Eaten by Other Life Forms

Water insects and algae appear to be eaten by the ducks.

What decomposers are in the area?

Bacteria and algae appear to be decomposing the leaf litter on the shore and in the water. This could be shown by the discoloration of the leaves which are slowly coming apart.

Sample Biology Lab Reports Some of the numbers have been changed from what is asked for in the lab so that the students have to do their own work.

**Laboratory Report** (20 points possible)*Procedure and Results**The pH of a solution*

1. *The pH of the distilled water is 7.*
2. *After adding 5 drops of vinegar to the distilled water, the pH is 6.*
3. *After adding 5 more drops of vinegar to the water from step 2, the pH is 4.*
4. *After adding an additional 5 drops of vinegar to the water from step 3, the pH is 2.*
5. *As more acid (vinegar) was added to the distilled water, the pH dropped, indicating increased acidity.*
6. *As ½ teaspoon of sodium bicarbonate was added to the acidic solution from step 4, the water foamed. The pH of the resulting solution was 8, indicating that the sodium bicarbonate decreased the acidity and increased the basic nature of the solution as indicated by the pH increase from 2 to 8.*

Hydrogen bonds between water molecules

1. *Water was added to a drinking glass carefully using a pipette until there was a slight mound in the middle of the water (meniscus).*
2. *I carefully laid a sewing needle on top of the water in the middle of the meniscus using a pair of tweezers. The sewing needle floated on top of the water because the hydrogen bonds between the water molecules caused the water molecules to "stick together" under the needle.*
3. *I added a drop of liquid dish soap to the water and the needle sank. It appeared that the soap disrupted the hydrogen bonds between the water molecules and the needle sank. The top layer of the water flattened out and the meniscus was disrupted.*

Sample Biology Lab Reports Some of the numbers have been changed from what is asked for in the lab so that the students have to do their own work.

Teacher Instructions for Quizzes and Examinations

Teacher's Instructions for Quizzes

The quizzes are to be given at the end of the study as per the schedule of the lessons. The students are to review the text of the lesson and the worksheets. Grade the quiz from the answers in the teacher's guide. Have the student look up any questions that were missed and explain to you what the correct answer should be and why. The quizzes are multiple choice and matching (with few exceptions) to make grading easier on your part. There are 28 quizzes with 15 points possible for each quiz. This gives a possible total of 420 points. The customary grading scale is:

90%–100% is an A;

80%–89% is a B;

70%–79% is a C;

60%–69% is a D and

59% and lower is an F.

In science studies, an A and B are very good. C is average.

D or F indicates the need for more maturity, more practice, or more study. Future success is always possible with maturity, study, and practice.

This applies to each individual quiz. At the end of the course, the average of the quizzes is to be added to the average of the exams to give a final score graded according to this scale. If a student misses more than 50% on a quiz, the quiz is to be retaken after careful study. You can give the student back $\frac{1}{2}$ point for each answer gotten correct the second time that was missed the first time. This can be done for up to 5 quizzes. I have found this policy to be very helpful for students that get off to a slow start. As well, I have found that a student's readiness for a study of this nature depends more upon maturity rather than age. Always encourage your student but still hold the standard and do not cut corners. That way the student will have the assurance of being able to go on to further studies and succeed.

There is no midterm or final examination because by its very nature, Biology is comprehensive. The concepts learned earlier are used in the later lessons and labs throughout the course.

Teacher's Instructions for Administering the Examinations

In the week of an examination, the student is to study the previous quizzes and the practice exercises for the lessons covered on the exam. The exam is like an expanded version of a quiz. Each exam consists of 30 multiple choice or matching questions (with few exceptions). The questions are not verbatim from the quizzes but are similar. An examination is a sampling of the material and does not include every point covered in the lessons.

A high school transcript usually has 1 grade for science courses (lab and lecture combined) and so this would appear as 1 credit with labs in Biology. (Note that some states may calculate credits in a different manner.) This can be determined by making the quizzes and exams 75 percent of the grade and the lab 25 percent of the grade. To find the lab grade take the total points earned from all of the labs divided by the total possible times 100. An example of finding the total grade is if the average of the quizzes and exams are 85 percent and the labs are 97 percent:

Quiz/Exam Average 85 x 3 = 255 + Lab 97 = 352 / 4 x 100 = 88% (B+) **Final Grade**

Grading Sheet

Lesson	Quiz	Exam	Lab
Lesson 1	_____ / 15		_____ / 20
Lesson 2	_____ / 15		_____ / 20
Lesson 3	_____ / 15		_____ / 20
Lesson 4	_____ / 15	Examination 1 _____ / 30	_____ / 20
Lesson 5	_____ / 15		_____ / 20
Lesson 6	_____ / 15		_____ / 20
Lesson 7	_____ / 15		_____ / 20
Lesson 8	_____ / 15		_____ / 20
Lesson 9	_____ / 15	Examination 2 _____ / 30	_____ / 20
Lesson 10	_____ / 15		_____ / 20
Lesson 11	_____ / 15		_____ / 20
Lesson 12	_____ / 15	Examination 3 _____ / 30	_____ / 20
Lesson 13	_____ / 15		_____ / 20
Lesson 14	_____ / 15		_____ / 20
Lesson 15	_____ / 15		_____ / 20
Lesson 16	_____ / 15	Examination 4 _____ / 30	_____ / 20
Lesson 17	_____ / 15		_____ / 20
Lesson 18	_____ / 15		_____ / 20
Lesson 19	_____ / 15	Examination 5 _____ / 30	_____ / 20
Lesson 20	_____ / 15		_____ / 20
Lesson 21	_____ / 15		_____ / 20
Lesson 22	_____ / 15	Examination 6 _____ / 30	_____ / 20
Lesson 23	_____ / 15		_____ / 20
Lesson 24	_____ / 15		_____ / 20
Lesson 25	_____ / 15	Examination 7 _____ / 30	_____ / 20
Lesson 26	_____ / 15		_____ / 20
Lesson 27	_____ / 15		_____ / 20
Lesson 28	_____ / 15	Examination 8 _____ / 30	_____ / 20
Total Score / Percent	_____ / 420 = _____ %	_____ / 240 = _____ %	_____ / 560 = _____ %
	Quizzes _____ % + Examinations _____ % / 2 = _____ %		_____ %

Quiz/Exam Average _____ x 3 = _____ + Lab _____ = _____ / 4 x 100 = _____ **Final Grade**

First Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
First Semester-First Quarter					
Week 1	Day 1	Begin Chapter 1 Chemical Principles in Biology • Read Pages 4–15 • <i>Biology</i> • (BIO) Begin Lesson 1 Worksheet 1 Pages 25–26 • <i>Teacher Guide</i> • (TG)			
	Day 2	Complete the reading and worksheet for Chapter 1; Focus on Vocabulary Words Page 6 • (BIO)			
	Day 3	Review Chapter 1 • Complete Quiz 1 Pages 239–240 • (TG)			
	Day 4	Read Laboratory 1 Biology — The Study of Life Pages 16–17 • (BIO) • Start Laboratory 1 Page 27 • (TG)			
	Day 5	Conclude Laboratory 1 and Prepare Lesson 1 Lab Report Page 29 • (TG)			
Week 2	Day 6	Begin Chapter 2 Water • Read Pages 18–23 • (BIO) Begin Lesson 2 Worksheet 1 Page 31 • (TG)			
	Day 7	Complete the reading and worksheet for Chapter 2; Focus on Vocabulary Words Page 20 • (BIO)			
	Day 8	Review Chapter 2 • Complete Quiz 2 Pages 241–242 • (TG)			
	Day 9	Read Laboratory 2 pH and Hydrogen Bonding of Water Molecules Pages 24–25 • (BIO) • Start Laboratory 2 Pages 33–34 • (TG)			
	Day 10	Conclude Laboratory 2 and Prepare Lesson 2 Lab Report Page 35 • (TG)			
Week 3	Day 11	Begin Chapter 3 Carbohydrates and Lipids • Read Pages 26–31 • (BIO) • Begin Lesson 3 Worksheet 1 Pages 37–38 • (TG)			
	Day 12	Complete the reading and worksheet for Chapter 3; Focus on Vocabulary Words Page 28 • (BIO)			
	Day 13	Review Chapter 3 • Complete Quiz 3 Pages 243–244 • (TG)			
	Day 14	Read Laboratory 3 Carbohydrates Pages 32–33 • (BIO) Start Laboratory 3 Pages 39–40 • (TG)			
	Day 15	Conclude Laboratory 3 and Prepare Lesson 3 Lab Report Pages 41–42 • (TG)			
Week 4	Day 16	Begin Chapter 4 Proteins and Nucleic Acids • Read Pages 34–41 • (BIO) • Begin Lesson 4 Worksheet 1 Pages 43–44 • (TG)			
	Day 17	Complete the reading and worksheet for Chapter 4; Focus on Vocabulary Words Page 36 • (BIO)			
	Day 18	Review Chapter 4 • Complete Quiz 4 Pages 245–246 • (TG)			
	Day 19	Read Laboratory 4 Nucleic Acids Pages 42–43 • (BIO) Start Laboratory 4 Pages 45–46 • (TG)			
	Day 20	Conclude Laboratory 4 and Prepare Lesson 4 Lab Report Page 47 • (TG)			
Week 5	Day 21	Review Lesson 1 and Lesson 1 Quiz			
	Day 22	Review Lesson 2 and Lesson 2 Quiz			
	Day 23	Review Lesson 3 and Lesson 3 Quiz			
	Day 24	Review Lesson 4 and Lesson 4 Quiz			
	Day 25	Take Exam 1 (Lessons 1–4) Pages 297–298 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 26	Begin Chapter 5 Nature of Cells • Read Pages 44–51 • (BIO) Begin Lesson 5 Worksheet 1 Pages 49-50 • (TG)			
	Day 27	Complete the reading and worksheet for Chapter 5; Focus on Vocabulary Words Page 46 • (BIO)			
	Day 28	Review Chapter 5 • Complete Quiz 5 Page 247 • (TG)			
	Day 29	Read Laboratory 5 Use of the Microscope Pages 52-55 • (BIO) Start Laboratory 5 Pages 51-53 • (TG)			
	Day 30	Conclude Laboratory 5 and Prepare Lesson 5 Lab Report Page 55 • (TG)			
Week 7	Day 31	Begin Chapter 6 Cell Membranes and Nucleus • Read Pages 56–61 • (BIO) Begin Lesson 6 Worksheet 1 Page 57 • (TG)			
	Day 32	Complete the reading and worksheet for Chapter 6; Focus on Vocabulary Words Page 58 • (BIO)			
	Day 33	Review Chapter 6 • Complete Quiz 6 Pages 249-250 • (TG)			
	Day 34	Read Laboratory 6 Cells Pages 62-65 • (BIO) Start Laboratory 6 Pages 59-61 • (TG)			
	Day 35	Conclude Laboratory 6 and Prepare Lesson 6 Lab Report Page 63 • (TG)			
Week 8	Day 36	Begin Chapter 7 Movement Through Cell Membranes • Read Pages 66–71 • (BIO) Begin Lesson 7 Worksheet 1 Page 65 • (TG)			
	Day 37	Complete the reading and worksheet for Chapter 7; Focus on Vocabulary Words Page 68 • (BIO)			
	Day 38	Review Chapter 7 • Complete Quiz 7 Pages 251-252 • (TG)			
	Day 39	Read Laboratory 7 Osmosis Pages 72–73 • (BIO) Start Laboratory 7 Pages 67-68 • (TG)			
	Day 40	Conclude Laboratory 7 and Prepare Lesson 7 Lab Report Pages 69-70 • (TG)			
Week 9	Day 41	Begin Chapter 8 Cell Organelles • Read Pages 74-81 • (BIO) Begin Lesson 8 Worksheet 1 Pages 71-72 • (TG)			
	Day 42	Complete the reading and worksheet for Chapter 8; Focus on Vocabulary Words Page 76 • (BIO)			
	Day 43	Review Chapter 8 • Complete Quiz 8 Pages 253-254 • (TG)			
	Day 44	Read Laboratory 8 Cell Structures Pages 82-85 • (BIO) Start Laboratory 8 Pages 73-74 • (TG)			
	Day 45	Conclude Laboratory 8 and Prepare Lesson 8 Lab Report Pages 75-76 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
First Semester-Second Quarter					
Week 1	Day 46	Review Lesson 5 and Lesson 5 Quiz			
	Day 47	Review Lesson 6 and Lesson 6 Quiz			
	Day 48	Review Lesson 7 and Lesson 7 Quiz			
	Day 49	Review Lesson 8 and Lesson 8 Quiz			
	Day 50	Take Exam 2 (Lessons 5–8) Pages 299-300 • (TG)			
Week 2	Day 51	Begin Chapter 9 Cell Division • Read Pages 86-91 • (BIO) Begin Lesson 9 Worksheet 1 Pages 77-78 • (TG)			
	Day 52	Complete the reading and worksheet for Chapter 9; Focus on Vocabulary Words Page 88 • (BIO)			
	Day 53	Review Chapter 9 • Complete Quiz 9 Page 255 • (TG)			
	Day 54	Read Laboratory 9 Cell Division Pages 92–93 • (BIO) Start Laboratory 9 Pages 79-80 • (TG)			
	Day 55	Conclude Laboratory 9 and Prepare Lesson 9 Lab Report Page 81 • (TG)			
Week 3	Day 56	Begin Chapter 10 Ecosystems • Read Pages 94–101 • (BIO) Begin Lesson 10 Worksheet 1 Page 83 • (TG)			
	Day 57	Complete the reading and worksheet for Chapter 10; Focus on Vocabulary Words Page 96 • (BIO)			
	Day 58	Review Chapter 10 • Complete Quiz 10 Page 257 • (TG)			
	Day 59	Read Laboratory 10 Ecosystems Pages 102–103 • (BIO) Start Laboratory 10 Pages 85-86 • (TG)			
	Day 60	Conclude Laboratory 10 and Prepare Lesson 10 Lab Report Pages 87-88 • (TG)			
Week 4	Day 61	Begin Chapter 11 Biomes • Read Pages 104-117 • (BIO) Begin Lesson 11 Worksheet 1 Pages 89-90 • (TG)			
	Day 62	Complete the reading and worksheet for Chapter 11; Focus on Vocabulary Words Page 106 • (BIO)			
	Day 63	Review Chapter 11 • Complete Quiz 11 Page 259 • (TG)			
	Day 64	Read Laboratory 11 Biomes Pages 118-119 • (BIO) Start Laboratory 4 Page 91 • (TG)			
	Day 65	Conclude Laboratory 11 and Prepare Lesson 11 Lab Report Page 93 • (TG)			
Week 5	Day 66	Begin Chapter 12 Energy Capture — Photosynthesis • Read Pages 120-127 • (BIO) Begin Lesson 12 Worksheet 1 Pages 95–96 • (TG)			
	Day 67	Complete the reading and worksheet for Chapter 12; Focus on Vocabulary Words Page 122 • (BIO)			
	Day 68	Review Chapter 12 • Complete Quiz 12 Page 261 • (TG)			
	Day 69	Read Laboratory 12 Photosynthesis Pages 128-129 • (BIO) Start Laboratory 12 Pages 97-98 • (TG)			
	Day 70	Conclude Laboratory 12 and Prepare Lesson 12 Lab Report Page 99 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 71	Review Lesson 9 and Lesson 9 Quiz			
	Day 72	Review Lesson 10 and Lesson 10 Quiz			
	Day 73	Review Lesson 11 and Lesson 11 Quiz			
	Day 74	Review Lesson 12 and Lesson 12 Quiz			
	Day 75	Take Exam 3 (Lessons 9–12) Pages 301-302 • (TG)			
Week 7	Day 76	Begin Chapter 13 Energy Release — Respiration • Read Pages 130-137 • (BIO) Begin Lesson 13 Worksheet 1 Pages 101-103 • (TG)			
	Day 77	Complete the reading and worksheet for Chapter 13; Focus on Vocabulary Words Page 132 • (BIO)			
	Day 78	Review Chapter 13 • Complete Quiz 13 Page 263 • (TG)			
	Day 79	Read Laboratory 13 Cellular Respiration Pages 138-139 • (BIO) Start Laboratory 13 Pages 105-106 • (TG)			
	Day 80	Conclude Laboratory 13 and Prepare Lesson 13 Lab Report Page 107 • (TG)			
Week 8	Day 81	Begin Chapter 14 Chromosomes and Genes • Read Pages 140-145 • (BIO) • Begin Lesson 14 Worksheet 1 Pages 109-110 • (TG)			
	Day 82	Complete the reading and worksheet for Chapter 14; Focus on Vocabulary Words Page 142 • (BIO)			
	Day 83	Review Chapter 14 • Complete Quiz 14 Pages 265-266 • (TG)			
	Day 84	Read Laboratory 14 Chromosomes and Genes Pages 146-149 • (BIO) • Start Laboratory 14 Pages 111-113 • (TG)			
	Day 85	Conclude Laboratory 14 and Prepare Lesson 14 Lab Report Page 115 • (TG)			
Week 9	Day 86	Begin Chapter 15 The Genetic Code • Read Pages 150-155 • (BIO) Begin Lesson 15 Worksheet 1 Pages 117-118 • (TG)			
	Day 87	Complete the reading and worksheet for Chapter 15; Focus on Vocabulary Words Page 152 • (BIO)			
	Day 88	Review Chapter 15 • Complete Quiz 15 Page 267 • (TG)			
	Day 89	Read Laboratory 15 The Genetic Code Pages 156-157 • (BIO) Start Laboratory 15 Pages 119-120 • (TG)			
	Day 90	Conclude Laboratory 15 and Prepare Lesson 15 Lab Report Page 121 • (TG)			
		Mid-Term Grade			

Second Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
Second Semester-Third Quarter					
Week 1	Day 91	Chapter 16 Expression of DNA — Transcription • Read Pages 158-163 • (BIO) Begin Lesson 16 Worksheet 1 Pages 123-124 • (TG)			
	Day 92	Complete the reading and worksheet for Chapter 16; Focus on Vocabulary Words Page 160 • (BIO)			
	Day 93	Review Chapter 16 • Complete Quiz 16 Page 269 • (TG)			
	Day 94	Read Laboratory 16 Transcription — mRNA Pages 164-167 • (BIO) • Start Laboratory 16 Pages 125-128 • (TG)			
	Day 95	Conclude Laboratory 16 and Prepare Lesson 16 Lab Report Page 129 • (TG)			
Week 2	Day 96	Review Lesson 13 and Lesson 13 Quiz			
	Day 97	Review Lesson 14 and Lesson 14 Quiz			
	Day 98	Review Lesson 15 and Lesson 15 Quiz			
	Day 99	Review Lesson 16 and Lesson 16 Quiz			
	Day 100	Take Exam 4 (Lessons 13–16) Pages 303-304 • (TG)			
Week 3	Day 101	Chapter 17 Expression of DNA — Translation • Read Pages 168-173 • (BIO) Begin Lesson 17 Worksheet 1 Pages 131-132 • (TG)			
	Day 102	Complete the reading and worksheet for Chapter 17; Focus on Vocabulary Words Page 170 • (BIO)			
	Day 103	Review Chapter 17 • Complete Quiz 17 Page 271 • (TG)			
	Day 104	Read Laboratory 17 Disruption of DNA Translation and Products of DNA Translation within Bacteria Cells Pages 174- 177 • (BIO) • Start Laboratory 17 Pages 133-136 • (TG)			
	Day 105	Conclude Laboratory 17 and Prepare Lesson 17 Lab Report Page 137 • (TG)			
Week 4	Day 106	Chapter 18 Perpetuation of Life • Read Pages 178-185 • (BIO) Begin Lesson 18 Worksheet 1 Pages 139-140 • (TG)			
	Day 107	Complete the reading and worksheet for Chapter 18; Focus on Vocabulary Words Page 180 • (BIO)			
	Day 108	Review Chapter 18 • Complete Quiz 18 Page 273 • (TG)			
	Day 109	Read Laboratory 18 Diverse Products of Protein Translation at Different Stages of Development Pages 186-189 • (BIO) Start Laboratory 18 Pages 141-143 • (TG)			
	Day 110	Conclude Laboratory 18 and Prepare Lesson 18 Lab Report Page 145 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 5	Day 111	Chapter 19 Genetics Patterns I • Read Pages 190-195 • (BIO) Begin Lesson 19 Worksheet 1 Pages 147-148 • (TG)			
	Day 112	Complete the reading and worksheet for Chapter 19; Focus on Vocabulary Words Page 192 • (BIO)			
	Day 113	Review Chapter 19 • Complete Quiz 19 Page 275 • (TG)			
	Day 114	Read Laboratory 19 Human Genetics Pages 196-199 • (BIO) Start Laboratory 19 Pages 149-152 • (TG)			
	Day 115	Conclude Laboratory 19 and Prepare Lesson 19 Lab Report Pages 153-155 • (TG)			
Week 6	Day 116	Review Lesson 17 and Lesson 17 Quiz			
	Day 117	Review Lesson 18 and Lesson 18 Quiz			
	Day 118	Review Lesson 19 and Lesson 19 Quiz			
	Day 119	Review Lessons 17–19			
	Day 120	Take Exam 5 (Lessons 17–19) Pages 305-306 • (TG)			
Week 7	Day 121	Chapter 20 Genetics Patterns 2 • Read Pages 200-207 • (BIO) Begin Lesson 20 Worksheet 1 Pages 157-158 • (TG)			
	Day 122	Complete the reading and worksheet for Chapter 20; Focus on Vocabulary Words Page 202 • (BIO)			
	Day 123	Review Chapter 20 • Complete Quiz 20 Page 277 • (TG)			
	Day 124	Read Laboratory 20 Dihybrid Test Cross with Corn Pages 208-211 • (BIO) • Start Laboratory 20 Pages 159-162 • (TG)			
	Day 125	Conclude Laboratory 20 and Prepare Lesson 20 Lab Report Page 163 • (TG)			
Week 8	Day 126	Chapter 21 Genetic Mutations and Variations • Read Pages 212-219 • (BIO) Begin Lesson 21 Worksheet 1 Pages 165-166 • (TG)			
	Day 127	Complete the reading and worksheet for Chapter 21; Focus on Vocabulary Words Page 214 • (BIO)			
	Day 128	Review Chapter 21 • Complete Quiz 21 Page 279 • (TG)			
	Day 129	Read Laboratory 21 Genetic Variation Pages 220-223 • (BIO) Start Laboratory 21 Pages 167-169 • (TG)			
	Day 130	Conclude Laboratory 21 and Prepare Lesson 21 Lab Report Page 171 • (TG)			
Week 9	Day 131	Chapter 22 Genomics • Read Pages 224-229 • (BIO) Begin Lesson 22 Worksheet 1 Page 173 • (TG)			
	Day 132	Complete the reading and worksheet for Chapter 22; Focus on Vocabulary Words Page 226 • (BIO)			
	Day 133	Review Chapter 22 • Complete Quiz 22 Page 281 • (TG)			
	Day 134	Read Laboratory 22 Plants Pages 230-233 • (BIO) Start Laboratory 22 Pages 175-177 • (TG)			
	Day 135	Conclude Laboratory 22 and Prepare Lesson 22 Lab Report Page 179 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Second Semester-Fourth Quarter					
Week 1	Day 136	Review Lesson 20 and Lesson 20 Quiz			
	Day 137	Review Lesson 21 and Lesson 21 Quiz			
	Day 138	Review Lesson 22 and Lesson 22 Quiz			
	Day 139	Review Lessons 20–22			
	Day 140	Take Exam 6 (Lessons 20–22) Pages 307-308 • (TG)			
Week 2	Day 141	Chapter 23 Plant Taxonomy • Read Pages 234-243 • (BIO) Begin Lesson 23 Worksheet 1 Pages 181-182 • (TG)			
	Day 142	Complete the reading and worksheet for Chapter 23; Focus on Vocabulary Words Page 236 • (BIO)			
	Day 143	Review Chapter 23 • Complete Quiz 23 Page 283 • (TG)			
	Day 144	Read Laboratory 23 Protists and Fungi Pages 244-247 • (BIO) Start Laboratory 23 Pages 183-186 • (TG)			
	Day 145	Conclude Laboratory 23 and Prepare Lesson 23 Lab Report Page 187 • (TG)			
Week 3	Day 146	Chapter 24 Animal Taxonomy — Invertebrates • Read Pages 248-257 • (BIO) Begin Lesson 24 Worksheet 1 Pages 189-191 • (TG)			
	Day 147	Complete the reading and worksheet for Chapter 24; Focus on Vocabulary Words Page 250 • (BIO)			
	Day 148	Review Chapter 24 • Complete Quiz 24 Page 285 • (TG)			
	Day 149	Read Laboratory 24 Invertebrate Animals Pages 258-263 • (BIO) Start Laboratory 24 Pages 193-198 • (TG)			
	Day 150	Conclude Laboratory 24 and Prepare Lesson 24 Lab Report Page 199 • (TG)			
Week 4	Day 151	Chapter 25 Animal Taxonomy — Vertebrates • Read Pages 264-277 • (BIO) Begin Lesson 25 Worksheet 1 Pages 201-203 • (TG)			
	Day 152	Complete the reading and worksheet for Chapter 25; Focus on Vocabulary Words Page 266 • (BIO)			
	Day 153	Review Chapter 25 • Complete Quiz 25 Page 287 • (TG)			
	Day 154	Read Laboratory 25 Vertebrate Animals Pages 278-283 • (BIO) Start Laboratory 25 Pages 205-208 • (TG)			
	Day 155	Conclude Laboratory 25 and Prepare Lesson 25 Lab Report Page 209 • (TG)			
Week 5	Day 156	Review Lesson 23 and Lesson 23 Quiz			
	Day 157	Review Lesson 24 and Lesson 24 Quiz			
	Day 158	Review Lesson 25 and Lesson 25 Quiz			
	Day 159	Review Lessons 23–25			
	Day 160	Take Exam 7 (Lessons 23–25) Pages 309-310 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 161	Chapter 26 Views of Biological Origins • Read Pages 284-295 • (BIO) • Begin Lesson 26 Worksheet 1 Pages 211-213 • (TG)			
	Day 162	Complete the reading and worksheet for Chapter 26; Focus on Vocabulary Words Page 286 • (BIO)			
	Day 163	Review Chapter 26 • Complete Quiz 26 Page 289 • (TG)			
	Day 164	Read Laboratory 26 Sedimentation and Fossils Pages 296-297 • (BIO) • Start Laboratory 26 Pages 215-217 • (TG)			
	Day 165	Conclude Laboratory 26 and Prepare Lesson 26 Lab Report Page 219 • (TG)			
Week 7	Day 166	Chapter 27 Evidences of Biological Origins • Read Pages 298-305 • (BIO) Begin Lesson 27 Worksheet 1 Pages 221-223 • (TG)			
	Day 167	Complete the reading and worksheet for Chapter 27; Focus on Vocabulary Words Page 300 • (BIO)			
	Day 168	Review Chapter 27 • Complete Quiz 27 Page 291 • (TG)			
	Day 169	Read Laboratory 27 Diversity Within Kinds of Creation Pages 306-307 • (BIO) • Start Laboratory 27 Pages 225-226 • (TG)			
	Day 170	Conclude Laboratory 27 and Prepare Lesson 27 Lab Report Page 227 • (TG)			
Week 8	Day 171	Chapter 28 Human Origins • Read Pages 308-315 • (BIO) Begin Lesson 28 Worksheet 1 Pages 229-231 • (TG)			
	Day 172	Complete the reading and worksheet for Chapter 28; Focus on Vocabulary Words Page 310 • (BIO)			
	Day 173	Review Chapter 28 • Complete Quiz 28 Page 293 • (TG)			
	Day 174	Read Laboratory 28 Human Origins Pages 316-319 • (BIO) Start Laboratory 28 Pages 233-234 • (TG)			
	Day 175	Conclude Laboratory 28 and Prepare Lesson 28 Lab Report Page 235 • (TG)			
Week 9	Day 176	Review Lesson 26 and Lesson 26 Quiz			
	Day 177	Review Lesson 27 and Lesson 27 Quiz			
	Day 178	Review Lesson 28 and Lesson 28 Quiz			
	Day 179	Review Lessons 26–28			
	Day 180	Take Exam 8 (Lessons 26–28) Pages 311-312 • (TG)			
		Final Grade			

**Worksheets
and
Laboratory Reports**

**Fill in the Blank**

1. All atoms with the same chemical behavior are the same _____.
2. The major building blocks of atoms are _____, _____, and _____.
3. The atomic number of an atom is its number of _____.
4. Atoms with the same atomic number are the same _____.
5. Atoms bonded together form _____.
6. Write out the chemical equation for photosynthesis.
7. _____ molecules of CO_2 are used to make one molecule of glucose.
8. For every molecule of glucose formed in photosynthesis, _____ molecules of O_2 are formed.
9. Draw the structural formula of glucose.
10. _____
11. There are _____ H atoms in one glucose molecule.
12. There are _____ C atoms in one glucose molecule.
13. _____ and _____ are found in the nucleus of an atom.
14. A proton has a charge of _____.
15. A neutron has a charge of _____.
16. An electron has a charge of _____.
17. The mass of an atom is determined by its _____ and _____.
18. An atoms atomic mass number is the sum of the number of its _____ and _____.
19. Isotopes are atoms that have the same number of _____ but different numbers of _____.
20. $^{14}\text{N}_7$ has _____ protons and _____ neutrons.
21. Are $^{14}\text{C}_6$ and $^{12}\text{C}_6$ isotopes of each other? Why?

22. Are $^{14}\text{C}_6$ and $^{14}\text{N}_7$ isotopes of each other? Why?
23. Erwin Schrodinger in 1926 described the electrons of atoms by their energies rather than their physical positions. He called these energy levels _____.
24. According to his model, there could be _____ electrons in the lowest energy level.
25. An atom would be more stable if there were a total of _____ electrons in the next energy level. An atom would gain or lose electrons to achieve this number of electrons.
26. Metal atoms like sodium and calcium tend to _____ electrons to achieve this number.
27. Non-metal atoms like oxygen and chlorine tend to _____ electrons to achieve this number.
28. When a sodium (metal) atom forms a bond with a chlorine (non-metal) atom, they form _____ bonds.
29. This is an _____ rather than a true physical bond.
30. The _____ charged sodium ion attracts the _____ charged chloride ion.
31. When two non-metal atoms (such as two oxygen atoms) bond together, they _____ electrons forming _____ bonds.
32. Carbon atoms with six electrons have _____ electrons in the lowest energy level and _____ electrons in the next higher energy level. They each need _____ electrons to make _____ electrons in the next higher energy level.
33. How many chemical bonds are there for each carbon atom in the glucose molecule?

**Laboratory 1: Biology — The Study of Life****Lab Notes:****REQUIRED MATERIALS**

- ☐ Pencil and paper

INTRODUCTION

This exercise sets the stage for the rest of this study. Biology is the study of the living. Think back to this laboratory exercise to keep a right perspective while doing the other laboratory exercises. The abundant forms and quantity of life that God has created and their relationships to each other is the focus of this study.

PURPOSE

To gain an overview perspective for the study of biology.

PROCEDURE

Go outside; find a quiet place to observe the life around you. Take a few minutes to just look at everything around you.

Make a list and brief description of most of the living things that you see. Use complete sentences so that it is meaningful to whoever reads this report. Write in such a way that someone else can picture in their mind what you are describing.

Identify what you could consider to be a keystone species. This is a life form that if removed would have an effect on the other life forms around it. An example would be a pine tree where squirrels get seeds for food from the pinecones. Describe why you consider it a keystone species.

Describe a life form that you see that feeds on another life form.

Describe a life form that you see that is food for another life form.

Dead organisms and waste products have to be broken down so that they can become nutrients for others (such as plants). Describe which life forms you see or know to be there (some are there even though you cannot see them) that carry out this role. These are called decomposers — usually bacteria and fungi.

Notes may be taken on the right of each lab, but complete sentences and all information need to be filled out on the actual Laboratory Report sheet.



1. Living things observed in the area

3. Life forms that feed upon other life forms

4. Life forms that are fed upon by other life forms

5. Decomposers in the area

**Fill in the Blank**

1. A water molecule has a partial _____ charge on the oxygen side and a partial _____ charge on the side of the hydrogen atoms.
2. This causes the hydrogen side of the water molecule to be _____ to the oxygen side of another water molecule.
3. This weak attraction is called a _____ bond.
4. The oxygen ends of water molecules are _____ charged and the hydrogen ends of water molecules are _____ charged.
5. Water molecules are polar and oil is _____.
6. The word for water loving is _____ and the word for water fearing is _____.
7. A calorie is the amount of heat energy necessary to raise _____ of water one degree Celsius.
8. Water has a _____ heat capacity, meaning that it takes _____ heat to boil water.
9. Ice is _____ dense than liquid water which is why ice _____ in liquid water.
10. If it were not for the _____ bonds between water molecules, water would boil at less than _____ °F.
11. Water dissolves polar compounds because of its _____ bonds.
12. About 1 out of every _____ water molecules comes apart as _____ and _____.
13. _____ is an acid.
14. _____ is a base.
15. pH = 7 is _____.
16. pH = 9 has _____ x more _____ than pH = 7.
17. pH = 6 has _____ x more _____ than pH = 7.



Lab Notes:

PROCEDURE

Answer the questions in this lab in your lab report with complete sentences.

The pH of a solution is measured by the reaction of H^+ ions and OH^- ions with indicator compounds in pH paper.

1. Add 50 ml (milliliters measured with a 50 ml graduated cylinder) of distilled water to a 100 ml beaker. Dip a piece of pH indicator paper in the water. Match the color of the wet pH paper to the color chart on the pH paper container to determine the pH of distilled water. Write down all of your results. You may use the lab notes section on the right.
2. Use the eyedropper to add 5 drops of vinegar to the distilled water and determine its pH.
3. Add another 5 drops of vinegar to the water and determine its pH.
4. Do this one more time and determine its pH.
5. Describe the trend in the pH values as more vinegar (acetic acid) is added. If you added more OH^- ions to water, the pH would increase.
6. Add about $\frac{1}{2}$ teaspoon of sodium bicarbonate (baking soda, $NaHCO_3$) to the water vinegar mixture. Describe what happens. Check the pH after the $NaHCO_3$ is added. What did the $NaHCO_3$ do to the pH?

Some plants (especially grasses) grow best when the soil is slightly acidic and dark green leafy plants and legumes (beans) favor slightly basic soil.

Digestive enzymes in your stomach function best in a strong acidic solution and the enzymes in the small intestine function best in a slightly basic fluid.

The following procedure demonstrates the hydrogen bonds between water molecules.

1. Fill a drinking glass with a smooth rim with water. Use an eyedropper to add water until the water forms a slight elevated dome over the middle of the water surface. This dome shape of the water surface is called a meniscus.
2. Take a sewing needle and with a pair of tweezers gently lay the needle on the top of the meniscus so that it floats. This is possible because of the hydrogen bonds between the water molecules. It is as if the water molecules are holding hands underneath the needle holding it so that it floats.
3. With the eyedropper, add a drop of liquid soap to the water. What happens to the needle and the meniscus? The soap disrupts the hydrogen bonds between the water molecules.



Laboratory Report (20 points possible)

The pH of a solution

Hydrogen bonding between water molecules

**Fill in the Blank**

1. Smaller units of larger molecules are called _____.
2. The larger molecules that are composed of many of the smaller units are called _____.
3. A 6 carbon carbohydrate molecule is called a _____.
4. Two 6 carbon sugar molecules bonded together are called _____.
5. Many 6 carbon sugar molecules bonded together are called _____.
6. Draw or write the molecular formula for glucose.

7. Fructose is found in _____.
8. Fructose is an _____ of glucose, meaning that it has the same number of each _____ as in glucose but they are in a different _____.
9. Sucrose (table sugar) is formed by bonding together a _____ molecule and a _____ molecule.
10. Glucose is a _____ molecule.
11. Sucrose is a _____ molecule.
12. Maltose is formed by bonding a _____ molecule to a _____ molecule.
13. Lactose is formed by bonding a _____ molecule to a _____ molecule.
14. Lactose is found in _____.
15. Many glucose molecules bonded together form a _____ molecule.
16. This is an example of a _____.
17. Two common starch molecules found in plants are _____ and _____.
18. Starch in animal tissues is called _____.
19. Starch serves the purpose of _____ in plant and animal cells.
20. Cellulose is a polymer formed by bonding of many _____ molecules in such a way that grazers and humans cannot digest it.
21. In grazers and termites, cellulose is digested by _____.
22. _____ is a polysaccharide found in the shells of insects and crustaceans.

23. Lipids include _____ and _____.
24. They are _____ (meaning water fearing).
25. In contrast to water, they are _____, meaning that they do not have positive and negative ends.
26. Animal fats are called _____.
27. The main backbone structure of animal fats is a _____ molecule.
28. _____ are attached to this backbone.
29. Fatty acids with no double bonds between their carbon atoms are called _____ fatty acids.
30. Fatty acids with one double bond between their carbon atoms are called _____ fatty acids.
31. Fatty acids with many double bonds between their carbon atoms are called _____ fatty acids.
32. Fats with many fatty acids with many double bonds are _____ at room temperature.
33. Fats with many fatty acids with no double bonds are _____ at room temperature.
34. Excess energy is first stored in _____ in the liver and then in _____ in the body's adipose tissue.

**Lab 3 — Carbohydrates****Lab Notes:****REQUIRED MATERIALS**

- ☐ Corn starch
- ☐ Sucrose (table sugar)
- ☐ Distilled water
- ☐ Stopper (from the supply kit)
- ☐ Iodine solution (from the supply kit)
- ☐ Eyedropper (from the supply kit)
- ☐ Test tubes (from the supply kit)
- ☐ Metric ruler (from the supply kit)
- ☐ Wax pencil (from the supply kit)
- ☐ Food items (potato, apple, banana, and corn kernel)

INTRODUCTION

Carbohydrates are essential to biological systems. Starches are important storage molecules that can be converted to monosaccharides yielding large amounts of useable energy.

Glucose is a 6 carbon sugar with the formula $C_6H_{12}O_6$.

Fructose (found in fruit) is also a 6 carbon sugar molecule with the same formula. These are monosaccharides (1 sugar unit).

Two glucose molecules combine to form the sugar maltose, which is used in making malted milk shakes. A glucose molecule combined with a fructose molecule is sucrose (sugar you place in your food). These are disaccharides (2 sugar units) with the formula $C_{12}H_{22}O_{11}$. Starches are long chains of glucose molecules called polysaccharides (many sugar units).

PURPOSE

This lab demonstrates how starches from food sources are broken down by saliva in the mouth before passing into the digestive tract.

PROCEDURE

Answer the questions in this lab in your lab report with complete sentences.

1. Use the wax pencil to place a mark on 4 test tubes 3 cm (centimeters) up from the bottom. Number the test tubes from 1 to 4.
2. Add just enough corn starch to cover the bottom of each test tube marked #1 and #2. Add just enough sugar (sucrose) to cover the bottom of each test tube marked #3 and #4.



Laboratory Report (20 points possible)

1. Results from test tube 1

2. Results from test tube 2

3. Results from test tube 3

4. Results from test tube 4

5. The effect of amylase on starch

6. The effect of amylase on sucrose

Starch content of potato

Lab result

Conclusion and explanation

Starch content of apple

Lab result

Conclusion and explanation

Starch content of banana

Lab result

Conclusion and explanation

Starch content of corn

Lab result

Conclusion and explanation

Quizzes

Match the Correct Answers

- | | |
|----------------------------|--|
| _____ 1. Electron | A. protons and neutrons |
| _____ 2. Mass of an atom | B. 8 neutrons |
| _____ 3. Atomic number | C. same number of protons but not neutrons |
| _____ 4. Isotope | D. negative charge |
| _____ 5. $^{14}\text{C}_6$ | E. protons |

Circle the correct answers

6. A glucose molecule has _____ carbon atoms.
- A. 2
 - B. 4
 - C. 6
 - D. 12
7. Metals tend to _____ electrons.
- A. gain
 - B. lose
 - C. annihilate
8. A proton has a charge of _____.
- A. +1
 - B. -1
 - C. 0
9. Metals and non-metals form _____ bonds.
- A. metallic
 - B. covalent
 - C. ionic
 - D. hydrogen
10. Non-metals and non-metals form _____ bonds.
- A. metallic
 - B. covalent
 - C. ionic
 - D. hydrogen

11. _____ is formed in photosynthesis.
- A. CO_2
 - B. O_2
 - C. H_2O_2
 - D. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
12. _____ is **not** an ion.
- A. O_2
 - B. Cl^-
 - C. Na^+
 - D. H^+
13. Elements are identified by their number of _____.
- A. protons
 - B. neutrons
 - C. electrons
 - D. glyptons
14. Schrodinger called the energy levels of electrons _____.
- A. layers
 - B. orbits
 - C. orbitals
 - D. calories
15. It was determined that atoms were more stable if they had _____ electrons in their outer shell.
- A. 2
 - B. 4
 - C. 6
 - D. 8

Exams

Match the Correct Answers

- | | |
|--------------------------------|---|
| _____ 1. Glucose | A. metal and non-metal |
| _____ 2. Metal | B. 6 carbon atoms |
| _____ 3. Non-metal | C. gains electrons |
| _____ 4. Covalent bond | D. loses electrons |
| _____ 5. Ionic bond | E. non-metal and non-metal |
| | |
| _____ 6. Isotope | A. 8 electrons in outer shell |
| _____ 7. Atomic number | B. + and – poles |
| _____ 8. More stable | C. same number of protons, different number of neutrons |
| _____ 9. Water | D. raise boiling point of water |
| _____ 10. Hydrogen bonds | E. protons |
| | |
| _____ 11. pH 3 | A. base |
| _____ 12. pH 9 | B. less dense than water |
| _____ 13. ^{-}OH | C. Schrodinger |
| _____ 14. Ice | D. more base than acid |
| _____ 15. Orbitals | E. more acid than base |
| | |
| _____ 16. Sucrose | A. animal starch |
| _____ 17. Glycogen | B. no double bonds |
| _____ 18. Triglycerides | C. polysaccharide |
| _____ 19. Cellulose | D. glucose, fructose |
| _____ 20. Saturated fatty acid | E. animal fat |
| | |
| _____ 21. Starch | A. stores lipids |
| _____ 22. Adipose tissue | B. carboxyl |
| _____ 23. Protein | C. RNA |
| _____ 24. $^{-}\text{COOH}$ | D. stored in liver |
| _____ 25. Uracil | E. chain of amino acids |

- | | |
|-------------------------------|----------------------------------|
| _____ 26. Ribose | A. backbone of nucleic acid |
| _____ 27. Thymine | B. tertiary structure of protein |
| _____ 28. Sugar-phosphate | C. RNA |
| _____ 29. ATP | D. high energy molecule |
| _____ 30. Folded spiral helix | E. DNA |

**Answers to Worksheets,
Laboratory Reports,
Quizzes
and
Exams**

Biology Worksheet and Lab Report Answer Keys

Lesson 1 Worksheet

1. Element
2. Protons, neutrons, electrons (in any order)
3. Protons
4. Element
5. Molecules
6. $12 \text{ H}_2\text{O} + 6 \text{ CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2 + 6 \text{ H}_2\text{O}$
7. 6
8. 6
9. Glucose — See Figure 1.1
10. 12
11. 6
12. Protons, neutrons (any order)
13. +1
14. Zero
15. -1
16. Protons, neutrons (any order)
17. Protons, neutrons (any order)
18. Protons, neutrons (in this order)
19. 7, 7
20. Yes. They both have 6 protons and they have different numbers of neutrons.
21. No. They have different numbers of protons.
22. Orbitals
23. 2
24. 8
25. Lose
26. Gain
27. Ionic
28. Attraction
29. Positive, negative (in this order)
30. Share, covalent
31. 2, 4, 4, 8
32. 4

Lesson 1 Lab Report

The student is to go to a place outdoors and describe the observed life forms. The report is to consist of complete sentences and clear descriptions. Award a possible 20 points for the overall descriptions:

- 8 points for identifying and describing a keystone species (one that if removed would have a large impact on the others)
- 6 points for identifying and describing consumers (feeders)
- 6 points for identifying and describing decomposers. The impacts of bacterial decomposition will be seen rather than the bacteria themselves. Mold also counts as a decomposer.

Lesson 2 Worksheet

1. Negative, positive (in this order)
2. Attracted
3. hydrogen
4. Negative, positive (In this order)
5. Non-polar
6. Hydrophilic, hydrophobic
7. 1 gram
8. High, a lot of
9. Less, floats
10. Hydrogen, -200
11. Hydrogen
12. 10,000,000 or 10 million or 10^7 , H^+ and ^-OH
13. H^+
14. ^-OH
15. Neutral
16. 100, ^-OH or base
17. 10, H^+ or acid

Lesson 2

Lab Report

When grading the lab report, award

- 10 possible points for following directions
- 10 points for answering the questions for the pH procedures and hydrogen bonding procedures

The answers are the student's observations. 20 points possible overall.

Lesson 3

Worksheet

1. Monomers
2. Polymers
3. Monosaccharide
4. Disaccharides
5. Polysaccharides
6. $C_6H_{12}O_6$
7. Fruit
8. Isomer, atom, arrangement
9. Glucose, fructose (either order)
10. Monosaccharide
11. Disaccharide
12. Glucose, glucose
13. Glucose, galactose (either order)
14. Milk
15. Starch
16. Polysaccharide
17. Amylose, amylopectin (either order)
18. Glycogen
19. Energy storage
20. Glucose
21. Microorganisms
22. Chitin
23. Fats, oils (either order)
24. Hydrophobic
25. Non-polar
26. Triglycerides
27. Glycerol

28. Fatty acids

29. Saturated

30. Monounsaturated

31. Polyunsaturated

32. Liquids (oils)

33. Solids

34. Glycogen, fat

Lesson 3

Lab Report

The report for steps 1–8 describes the results for test tubes 1–4. The answers to the questions are the student's observations. Award

- 15 possible points for steps 1–8
- 5 possible points for the answers (student observations) for step 9. Iodine turns food dark blue or black when starch is present

20 points possible overall.

Lesson 4

Worksheet

1. Muscle tissue, cell membranes, and enzymes (any order)
2. Amino acids
3. Amino, carboxyl (in this order)
4. Acid
5. R
6. Glycine, H (hydrogen)
7. Peptide
8. Dipeptide
9. Polypeptide
10. Sequence of amino acids
11. Spiral helix or sheet formed by the chain of amino acids
12. Spiral helix or sheet folding upon itself
13. Attachment of two or more polypeptide chains to each other
14. Enzymes
15. Substrate
16. DNA, RNA

Biology — Quiz Answer Keys

Quiz #1

Chemical Principles in Biology

1. D
2. A
3. E
4. C
5. B
6. C
7. B
8. A
9. C
10. B
11. B
12. A
13. A
14. C
15. D

Quiz #2

Water

1. D
2. B
3. B
4. D
5. C
6. A
7. C
8. B
9. D
10. A
11. B
12. C
13. D
14. A
15. E

Quiz #3

Carbohydrates and Lipids

1. E
2. A
3. D
4. C
5. B
6. D
7. B
8. C
9. C
10. B
11. B
12. D
13. C
14. E
15. A

Quiz #4

Proteins and Nucleic Acids

1. A
2. D
3. B
4. E
5. C
6. B
7. A
8. C
9. B
10. D
11. E
12. A
13. C
14. D
15. B

Biology — Exam Answer Keys

Examination #1 (Lessons 1–5)

1. B
2. D
3. C
4. E
5. A
6. C
7. E
8. A
9. B
10. D
11. E
12. D
13. A
14. B
15. C
16. D
17. A
18. E
19. C
20. B
21. D
22. A
23. E
24. B
25. C
26. C
27. E
28. A
29. D
30. B

Examination #2 (Lessons 5–8)

1. E
2. C
3. A

4. D
5. B
6. D
7. C
8. E
9. B
10. A
11. B
12. A
13. D
14. E
15. C
16. C
17. D
18. A
19. B
20. E
21. C
22. B
23. E
24. D
25. A
26. B
27. D
28. A
29. E
30. C

Examination #3 (Lessons 9–12)

1. B
2. D
3. E
4. C
5. A
6. D
7. A